XIV. *A Letter from Mr.* Peter Dollond, *to* Nevil Maſkelyne, *F. R. S. and Aſtronomer Royal; deſcribing ſome Additions and Alterations made to* Hadley's *Quadrant, to render it more ſerviceable at Sea.*

Reverend Sir,

Read March 29, 1772.

THE particular attention, you have always ſhown to any improvement tending to the advantage of aſtronomy or navigation, makes me take the liberty to trouble you with an account of ſome additions and alterations I have lately made to the Hadley's quadrant.

The general uſe of this inſtrument at ſea is ſo well known, that no mention need be made of the importance of any improvements in the conſtruction, that may render the obſervation more exact, and occaſion more frequent opportunities of making them.

The glaſſes of the Hadley's quadrant ſhould have their two ſurfaces perfect planes, and perfectly parallel to each other. From ſeveral years practice in grinding theſe glaſſes, I have found out methods of making them to great exactneſs; but the advantage, that ſhould ariſe from the goodneſs of the glaſſes, has

has oftentimes been defeated by the index glaſs being bent by the braſs frame that contains it: to prevent this, I have contrived the frame, ſo that the glaſs lies on three points, and the part that preſſes againſt the front of the glaſs has alſo three points exactly oppoſite to the former. Theſe points are made to confine the glaſs by three ſcrews at the back, that act exactly oppoſite to the points between which the glaſs is placed. This little contrivance may be of ſome uſe; but the principal improvements are in the methods of adjuſting the glaſſes, particularly for the back obſervation.

The method hitherto practiſed for adjuſting that part of the inſtrument, by means of the oppoſite horizons at ſea, has been attended with ſo many difficulties that it has ſcarce ever been uſed; for ſo little dependance could be made on the obſervations taken this way, that the beſt Hadley's ſextants made for the purpoſes of obſerving the diſtances of the Moon from the Sun or fixed ſtars, have been always made without the horizon glaſs for the back obſervation; for want of which, many valuable obſervations of the Sun and Moon have been loſt, when their diſtance has exceeded 120 degrees.

To make the adjuſtment of the back obſervation eaſy and exact, I have applied an index to the back horizon glaſs, by which it may be moved into a parallel poſition to the index glaſs, in order to give it the two adjuſtments, in the ſame manner as the fore horizon glaſs is adjuſted. Then, by moving the index to which the back horizon glaſs is fixed, exactly 90 degrees (which is known by the diviſions made for that purpoſe) the glaſs will be thereby ſet at right angles to the index glaſs, and conſequently will be properly adjuſted for uſe, and the obſervations may be made with the ſame accuracy by this, as by the fore obſervation.

To adjuſt the horizon glaſſes in the perpendicular poſition to the plane of the inſtrument, I have contrived to move each of them by a ſingle ſcrew, that goes through the frame of the quadrant, and is turned by means of a milled head at the back, which may be done by the obſerver while he is looking at the object.

To theſe improvements, Sir, I have added your method of placing darkening glaſſes behind the horizon glaſſes, which you have been ſo kind as to give me liberty to apply to my inſtruments. Theſe glaſſes, which ſerve for darkening the object ſeen by direct viſion, in adjuſting the inſtrument by the Sun or Moon, I have placed in ſuch a manner as to be turned behind the fore horizon glaſs, or behind the back horizon glaſs, that they may be uſed with either; there are three of theſe glaſſes of different degrees of darkneſs; the lighteſt or paleſt I do imagine will be of uſe in taking the Sun's altitude when the horizon appears glaring, which I believe often happens by the reflection of the ſea.

If theſe additions and alterations ſhould be thought to be real improvements, which I cannot doubt, Sir, if they are honoured with your approbation, I hope they may ſerve in conjunction with thoſe improvements you have made yourſelf in reſpect to the obviating any poſſible errors in the paralleliſm of the planes of the index glaſs, and in regard to the adjuſtment of the teleſcope parallel to the plane of the

quadrant,

quadrant, to extend the uſe of this moſt valuable nautical inſtrument, and to add to the exactneſs of the celeſtial obſervations taken with it to determine the longitude at ſea. But of theſe particulars I need ſay no more, ſince you are, without doubt, in every reſpect, the propereſt perſon to give an account of them.

I am, SIR,

Your moſt obedient,

humble ſervant,

London, February 25,
1772.

Peter Dollond.